ATTACHMENT II-1-12-1

THERMAL DESORPTION SHAKEDOWN OPERATIONS AND WASTE FAMILY DEMONSTRATION TESTING

1. PURPOSE AND SCOPE

   a. This Attachment outlines the requirements necessary to perform initial start-up operations, Functional Testing, Shakedown Operations, and Waste Family Demonstration Testing for the Thermal Desorption (TD) system.

   b. The requirements of this Attachment shall be completed for the initial establishment of the TD unit and whenever new equipment is added. However, the requirements of this Attachment will not be required if a piece of equipment is replaced by an equivalent as approved by the Executive Secretary

   c. The Waste Family Demonstration Testing requirements of this Attachment and Attachment II-1-12-2, *Pre-Demonstration Plan* shall be completed whenever a new waste family is introduced as feed material into the TD unit. Waste families are defined in Attachment II-1-12, *Thermal Desorption Separation Plan.*

   d. The results of these tests shall be used to determine the operating parameters of the TD unit and shall be used to update the requirements of Attachment II-1-12, *Thermal Desorption Separation Plan*, as necessary.

   e. Definitions

      i. *Functional Testing* is defined as initial testing of the TD unit equipment after set-up. Hazardous waste or materials shall not be processed during Functional Testing. Functional Testing includes verifying the operation of all mechanical equipment, completing a Systems Demonstration Test, and verifying operation of the AWFCO system.

      ii. *Pre-Test* is a test performed during Shakedown Operations that provides assurance that removal efficiencies and risk based emissions shall be within acceptance criteria.

      iii. *Principal Organic Hazardous Constituents* (POHCs) are specific compounds that are representative of waste families processed through the TD unit. POHCs are spiked into the feed material during the Waste Family Demonstration Testing and are monitored to assure removal efficiencies are within acceptance criteria.

iv. *Removal Efficiency* (RE) is defined as the percentage of POHC and known waste contaminants removed from the feed material prior to reaching the off-gas stream. Removal efficiency is defined by the following equation:

$$RE = \frac{mass_{feed} - mass_{off\text{-}gas}}{mass_{feed}} \times 100\% .$$

v. *Shakedown Operations* is an optimization process for the TD unit. Shakedown Operations are completed to find preliminary operating parameters that shall be used in the Waste Family Demonstration Test. Shakedown Operations shall also include the Pre-Test.

vi. The *Systems Demonstration Test* is a test of the TD unit using clean fill material that is performed within the Functional Testing phase. This demonstration is used to verify the proper operation of the TD unit.

vii. Definitions of other key words used in this Attachment may be found in Section 2 of Attachment II-1-12, *Thermal Desorption Separation Plan*.

2. OPERATIONAL PLAN

a. After completion of the Functional Testing, the system shall undergo all of the testing requirements of this Attachment, including Shakedown Operations, and Waste Family Demonstration Testing.

b. Prior to Waste Family Demonstration Testing, the Permittee shall submit a request to modify Attachment II-1-12-2, *Pre-Demonstration Plan*.

c. The Waste Family Demonstration Testing requirements are contained in Attachment II-1-12-2, *Pre-Demonstration Plan*.

d. The Permittee may use prior results of Functional Testing and Shakedown Operations. However, Functional Testing and Shakedown Operations are not required to be performed during Waste Family Demonstration Testing but shall be explained and justified within a Pre-Demonstration Plan (PDP).

e. At a minimum, a PDP shall contain the following:

i. a detailed description of the system and all equipment, including any additional features that have been added or changed since previous tests;

ii. a review of results from previous tests;

iii. a description of any feed material used during the tests;

iv. preliminary operating parameters;

v. Data Quality Objectives (DQOs) and analytical verification testing to achieve the DQOs;

vi. a Sampling and Analysis Plan;

vii. quality assurance/quality control (QA/QC) measures for operational testing and analytical data;

viii. expected secondary waste streams and by-products and a discussion of their final disposition;

ix. an outline of the testing; and

x. names of operators and contact personnel, including emergency coordinators.

f. Upon completion of each phase of the testing (e.g., Functional Testing or Shakedown Testing), a preliminary report shall be submitted to the Executive Secretary. These preliminary reports shall contain all required analytical data and process information. The data and information required for each phase shall be detailed in a PDP.

g. A comprehensive Post-Waste Family Demonstration Report shall be prepared within 120 days of the completion of the Waste Family Demonstration Testing. This report shall contain, at a minimum:

i. any operational deviations from a PDP, and justifications for the deviations;

ii. a declaration that the data confirm that the TD unit is either capable of treating the tested waste family or that Waste Family Demonstration Testing was unsuccessful.

iii. all testing results, as defined in a PDP, and commentary on the results;

iv. a comparison of the testing results to the DQOs;

v. operating parameters for the TD unit;

vi. suggested permit conditions based upon the testing results; and

vii. lessons learned during the testing processes.

3. FUNCTIONAL TESTING

a. Functional Testing shall be performed during initial establishment of the TD unit and whenever new equipment is added. However, Functional Testing will not be required if a piece of equipment is replaced by an equivalent as approved by the Executive Secretary.

b. Functional Testing shall be completed prior to feed material being processed through the TD unit.

c. Functional Testing shall be comprised of the following tests:

i. An Equipment Test, wherein each component of the TD unit is operated independently to verify proper equipment function. All equipment shall be verified operational prior to the System Demonstration Test.

ii. A Systems Demonstration Test, is a test of the entire TD unit prior to the introduction of feed material.

iii. An Automatic Waste Feed Cutoff (AWFCO) System functional test to verify that the AWFCO is functioning properly.

d. All process monitoring equipment shall be calibrated in accordance with manufacturer's specifications prior to the Systems Demonstration Test. A copy of the manufacturer's manuals and specifications for all process monitoring equipment shall be required to be submitted to the Executive Secretary prior to the Systems Demonstration Test.

e. A Systems Demonstration Test shall be performed prior to the introduction of contaminated feed material into the TD unit. The Systems Demonstration Test shall be performed as follows:

i. At least four drums of clean fill soil shall be processed through the TD unit.

ii. Clean fill soil may be obtained from non-contaminated excavations at the Clive site or purchased from a suitable off-site source.

iii. The clean fill soil shall be screened to eliminate feed material greater than four inches in size.

iv. At least three process cycles shall be completed.

v. Verification of all components and subsystems, by a qualified TD operator, shall be completed prior to TD unit operations using contaminated feed material.

f. The objective of the Systems Demonstration Test shall be clearly defined within a PDP. In general, the Systems Demonstration Test shall be used to verify successful TD equipment operation.

g. All aspects of Functional Testing, including the Systems Demonstration Test, shall be documented in the Post-Waste Family Demonstration Report.

4. SHAKEDOWN OPERATIONS

a. Shakedown Operations shall be performed after Functional Testing and Systems Demonstration Test have been completed.

b. Shakedown Operations shall be defined as a maximum of 360 hours of operation.

c. The Permittee may request up to three additional 360 hour periods of shakedown if necessary. The Permittee shall not proceed with additional shakedown periods without Executive Secretary approval.

d. Shakedown Operations shall be completed to obtain preliminary operating parameters to be used during Waste Family Demonstration Testing.

e. Shakedown Operations shall be completed to obtain successful maximum feed rates.

f. Shakedown Operations shall be completed using contaminated feed material.

g. Specifications for preliminary Shakedown Operations and initial operating conditions shall be defined and justified in a PDP.

i. Sampling and analysis of the processed material from Shakedown Operations shall be used to establish TD operating parameters for each waste family within the time constraints identified in Condition 4.b. above.

h. Within the Shakedown Operations, a Pre-Test shall be performed to establish equivalent Removal Efficiencies (RE) for Principal Organic Hazardous Constituents (POHCs) and known contaminants in the waste within the TD unit.

i. The Pre-Test shall consist of the following:

i. a determination of representative POHCs;

ii. the spiking of feed material with the chosen POHC(s), as necessary;

iii. the sampling of feed material as it is loaded into the TD unit;

iv. the analysis of feed material samples for POHC concentration(s);

v. the analysis of feed material for hazardous constituents

vi. the processing of feed material through the TD unit;

vii. the sampling of process vent emission;

viii. the analysis of the process vent emission sample for POHC concentration(s);

ix. the combination of feed material and process vent emission analytical results with the mass flow rates of the streams to calculate a RE through the TD unit;

x. the analysis of the condensate.

j. Calculated data from the Pre-Test shall be submitted to the Executive Secretary for review and approval as required by Condition 2.f of this Attachment. The calculated data shall verify that a POHC RE of at least 99.99% was achieved or that a POHC RE was not attained.

k. If a POHC RE of 99.99% is not attained within the time constraints identified in Condition 4.b. and 4.c. of this Attachment, one of the following options shall be employed:

i. The failing POHC shall be rejected and Attachment II-1-12, *Thermal Desorption Separation Plan*, shall be adjusted to disallow TD operations for separation of the POHC and other compounds represented by the POHC. A report shall be submitted to the Executive Secretary detailing the failure.

ii. Upon written request by the Permittee, the Executive Secretary may approve a RE for a known contaminant in the waste less than 99.99%. The Permittee shall demonstrate why a RE of less than 99.99% is justified.

5. WASTE FAMILY DEMONSTRATION TESTING

a. Waste Family Demonstration Testing shall consist of at least two process runs based on the preliminary operating parameters established during Shakedown Operations.

b. A schedule, complete with dates, times, tests (APC or Operational) and organization charts (emission contractor, EC personnel, TD contractor personnel, etc.), shall be submitted to the Executive Secretary seven days prior to commencement of Waste Family Demonstration Testing.

c. Detailed conditions of Waste Family Demonstration Testing shall be included in a PDP. In general, Waste Family Demonstration Testing shall consist of the following:

   i. a determination of representative POHC's;

   ii. the spiking of feed material with the chosen POHC(s), as necessary;

   iii. the sampling of feed material as it is loaded into the TD unit;

   iv. the analysis of the feed material sample for POHC concentration(s);

   iv. the processing of feed material through the TD unit;

   v. the sampling of process vent emission for POHCs;

   vi. the analysis of the process vent emission sample for POHC concentration(s);

   vii. the combination of feed material and process vent emission analytical results with the mass flow rates of the streams to calculate a RE for POHCs through the TD unit; and

   viii. the sampling and analysis of processed material and condensate to achieve a mass balance and fate analysis for the POHC(s).

d. In addition to POHCs, known waste contaminants shall also be analyzed within the feed material, processed material, condensate, and process vent emissions. REs will be calculated for all such waste contaminants.

e. Process vent emissions shall also be tested for hydrogen chloride, dioxins and furans, toxic metals, carbon monoxide, radioactive isotopes, carbon dioxide, and visual opacity.

f. All sampling intervals shall be established and justified within a PDP.

g. Data from Waste Family Demonstration Testing shall be reported, with maximum, minimum, and average values presented, in the Post-Waste Family Demonstration Report.

h. Prior to processing of a new waste family through the TD unit, the Waste Family Demonstration Testing requirements in Section 5 of this Attachment shall be completed. Shakedown Operations shall also be performed if requested by the Executive Secretary.

6. SAMPLING AND ANALYTICAL METHODS

a. A sampling plan shall be completed for Waste Family Demonstration Testing and shall be included in a PDP. This plan shall include the following information for each sampling point:

i. a unique sample designation;

ii. the parameter(s) being measured;

iii. sampling and analytical methods used; and

iv. the frequency of the sampling.

b. The Permittee shall adhere to the preservation and holding times inherent to the analytical methods. Violation of these parameters shall invalidate the sample.

c. The feed material shall be sampled as it is being loaded into the feed hopper. The method for sampling feed material shall be included in a PDP.

d. The processed material shall be sampled as it is discharged from the TD unit for each process cycle. The method for sampling processed material shall be included in a PDP.

e. Process vent samples shall be collected from a sampling access port located after the primary and secondary carbon adsorption beds.

f. The process vent shall be sampled with multiple simultaneous sampling trains using methods from 40 CFR 60 Appendix A, including:

i. Method SW-846-0010 with 8270 for Semi-Volatile Organics (SVOCs);

ii. Method 23 for dioxins and furans;

iii. Method 5 for particulate matter, toxic metals, and radioactive isotopes;

iv. Method 26A for hydrogen chloride/chlorine;

v. Method 10 for carbon monoxide;

vi. Method SW-846-0030 (VOST), or Method 18 for Volatile Organics (VOCs); and

vii. Methods 1 through 4 for gas velocity, moisture content, molecular weight, etc., in support of the above methods.

g. The condensate transfer tank shall be sampled through access ports at the recirculation line.

h. Duplicate samples and field blanks shall be collected at an interval of at least 10% of the samples collected, to provide Quality Assurance (QA) during the sampling scheme. The QA testing shall be described in a PDP and documented in the Post-Waste Family Demonstration Report.

End of Attachment II-1-12-1